A PHYSICALLY-BASED, PROBABILISTIC MODEL FOR ULTRASONIC IMAGES INCORPORATING SHAPE, MICROSTRUCTURE AND SYSTEM CHARACTERISTICS

Abstract

The present invention is a method and apparatus that creates a physical model of image formation and performs a random phasor sum representation of the physical model to create the probabilistic model. The physical model incorporates imaging system characteristics, gross shape and microstructure. The phasor sum representation results from a linear model of the imaging system characteristics as characterized by a point spread function. Tissue microstructure is characterized by multiple discrete scatterers distributed across a surface of the gross shape. Each discrete scatterer contributes a phasor to the phasor sum representation. The image model is formed using image pixel-based statistics. Amplitude mean, amplitude variance and a ratio of amplitude mean to standard deviation is computed at each image pixel. Based on the computations, each pixel is classified as Rayleigh or Gaussian and assigned a density function. A data likelihood is constructed as a product of the assigned density functions.